UCRL-JC-124875 Abs

Effect of SiO_2 overcoat thickness on laser damage morphology of HfO_2/SiO_2 Brewster's angle polarizers at 1064 nm*

C. J. Stolz, F. Y. Génin, T. A. Reitter
University of California
Lawrence Livermore National Laboratory
P. O. Box 808, L-463
Livermore, CA 94550

R. P. Bevis, M. K. von Gunten
Spectra-Physics Lasers, Inc.
Components and Accessories Group
P.O. Box 7013
Mountain View, CA 94943

J. Hue
LETI-CEA-DOPT- Couches Minces pour l'Optique (CMO)
CENG,17, avenue des martyrs
38054 GRENOBLE Cedex 09 FRANCE

ABSTRACT

HfO_2/SiO_2 Brewster's angle polarizers are being developed at Lawrence Livermore National Laboratory for the National Ignition Facility. Damage threshold studies using a 3-ns pulse length 1064-nm laser have revealed a number of different damage morphologies such as nodular ejection pits, plasma scalds, and outer layer delaminations. Of these damage morphologies, delaminations have the most negative impact on fusion laser performance. By increasing the thickness of the SiO_2 overcoat, the delamination morphology is eliminated without adversely modifying the spectral characteristics of the coating.

A model of the thermal mechanical response of the outer layers is presented for various SiO_2 overlayer thicknesses. The overlayer thickness influences the electric-field profile resulting in different thermal gradients between the outer SiO_2 and HfO_2 layers. This modeling effort attempts to understand the relationship between the thermal stress distribution in the outer layer and the occurrence of delamination.

*Work performed under the auspicies of the U. S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.